



# WORM TEA COMPOSTING GUIDE

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By Grayson Hodge  
Weber State University

## Worm-Tea Composters

My name is Grayson Hodge, I graduated from Weber State University with a Bachelors in Botany in the Spring of 2020. During 2019 I became the Community Garden Coordinator on campus. Over that summer I played around and experimented with worm composting and learned a lot from my experience. The following is a detailed how-to from start to finish for creating and maintaining a worm tea composter based on my personal experience and understanding of soil science.

A worm-tea composter helps reduce food waste by turning kitchen scraps or expired produce into usable fertilizers. This style of composter creates two forms of usable compost. First is the tea, which will collect in the bottom container to be used as needed. Second, are the worm castings that can be harvested every three to four months depending on the size of the container.

### Construction

A few tools will allow you to create your very own composter for very little money. There are countless DIY guides available over the internet for just about any form factor you wish to work with. This guide uses two bins. One to house the worms and another to collect the compost tea.

For the composter you will need:

1. Two containers that fit inside of each other with a fitting lid.
  - a. Five-gallon buckets naturally create a space between the buckets. It's recommended that the container that catches the tea has several inches of space between the container housing the compost. If your containers have very little space in between each other a gap can simply be created by improvising some form a spacer. For example, bricks or scrap two-inch PVC. So long as the material can tolerate being wet for a prolonged period it should be fine.
2. A power drill and a two-inch bore bit.
  - a. Depending on the stiffness of the material of your containers an Exacto-knife may also work.
3. Exacto-knife or similarly sharp blade.
4. Plastic screen mesh, one that would be used for screen doors or windows.
5. All-weather interior/exterior caulk or glue, or Duct-tape
  - a. Recommend Dynaflex 230
6. Composting worms

- a. Recommend red wigglers from [unclejimswormfarm.com](http://unclejimswormfarm.com)
  - b. Depending on the size of your bin 250 worms should be more than enough for any starting bin. Any composter that are 20 gallons or more can house upwards of 1,000 worms
7. Bedding material, non-glossy newsprint, some peat moss, coconut coir, soil or old potting soil.
  - a. Sand is a useful additive later-on.
  - b. Non-waxy cardboard is also useful when starting.
8. [Optional]: If you are using a larger bin it may be beneficial to create an aeration tube to allow for improved gas exchange inside the composter. This can be done in many ways; one easy method is to take some scrap PVC no smaller than 3/4 inch in diameter with a T junction. Drilling various holes along the sides of the PVC and cleaning up the holes. This will allow for better gas exchange deeper inside the composter.

## Assembly

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Step One: Using a drill and a two-inch bore bit create a ventilation hole in the lid and drain at the bottom of one container. The housing container has the drain hole, and the other container collects the tea. A single ventilation hole should be enough for a small composter, adding more will not hurt the compost.

- Using the Exacto-knife create scores on the underside of the lid around any ventilation holes. This will create a textured surface for the glue or tape to better grab onto.

Step Two: Cut pieces of screen. One large enough of the bottom of the housing container and another for the ventilation.

- This is a good time to glue the screen to the ventilation hole. Simply add several dollops of glue around the scored area, then apply the mesh and work the glue into the mesh. Careful to avoid getting the glue around the ventilation hole. There should be an even cover of glue around the mesh to ensure it stays in place.
- [NOTE] If you do not have an all-weather adhesive, duct tape should work last for a time.
- Cut and fit some mesh inside at the bottom of the housing bin. This will prevent the worm falling into the tea bin. Occasionally though worms will get through depending on the size of the screen

Step Four: Add a layer of wet, shredded, newspaper to the bottom of the housing bin, then a layer of peat then another layer of newspaper. If you have sand available put in a thin layer. This will help improve drainage and give a gritty material for the worms to use. Add green composting material along with shredded newspaper and cardboard and cover it with more wet newspaper then place worms inside.

Step Five: Allow any glue to dry then cover the housing bin with the lid and place the housing into the tea collecting bucket. The composter is now complete. Whenever a significant amount of compost material is added to the bin cover it with shredded newspaper. Keep the composter in a shady location. If done correctly the composter could be left inside without smelling like rotting trash.

## Upkeep

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There are two major components in compost. Nitrogenous material, greens, and carbon sources, browns. Always ensure there are enough carbon sources in your composter. The following will go into detail about green and brown sources, and how to maintain your composter.

### **What are Greens?**

Green material would be fruit and veggie scraps. The worms can eat their own weight every other day and the population can double in just a few months, so as time goes by you may need to increase the amount of green material added. Avoid using cooked items as these could spoil the compost. Banana peels are a favorite of the worms for both food and reproduction. Coffee grounds a great green source and adds grit to the worm diet. Be careful as too many coffee grounds can make the compost acidic. Add acidic items such as tomatoes and citrus fruits sparingly for the same reason. Just know that any raw fruit added to the composter will have seeds. These seeds can germinate after you harvest your castings a few months down the road.

Corn cobs and corn husks are great materials for the composter. The cob has various nooks and crannies for the worms to hide and lay eggs in and the husk makes a great green cover. Raw cobs may take some time to break down. If the cob was cooked in any way thoroughly rinse it to remove oils or salt that may have been added. The husk should also be rinsed to remove any lingering pesticides or herbicides.

As material is added to the system it may attract mites which may look like small white eggs on the side of your bin, this is a sign of too much wet organic material. Let the bin sit for a few weeks for nature to take its course or remove the excess green material. Other small insects will likely make their way into the bin. This should not be an issue unless you have an excess of flies and fungus gnats. Then your compost is too wet with too much green material.

### **What are Browns?**

Carbon materials are easy enough to come across. Shredded cardboard without a waxy or plastic film, newspaper, straw, and egg cartons are great carbon sources that will break down at a similar rate to your green materials. Wood chips and wood shavings also work as a carbon source but take a very long time to break down. Dried fall leaves also a great carbon source. Shredding corrugated

cardboard also creates a good space for worms to lay eggs in. Avoid using printing paper as this material is often bleached.

### **Inside the Composter**

A good ratio is to keep a 50:50 green to brown ratio. Too much green and your compost will begin to stink. Too much carbon should not be an issue. A good rule of thumb is whenever a large amount of green material is added cover it with brown. Your composter will work wonders if you layer the materials.

The compost tea should not smell rotten, it should have a yeasty or earthy smell to it, this is caused by soil bacterium, *Streptomyces*. If the tea smells bad it's a good sign that your compost has too much green material and the compost could become anerobic, where there is little to no oxygen in the environment. Solve this by removing excess green material from the composter or add more brown.

Occasionally add some water to your composter. This will help the formation of the compost tea and keep the environment moist allowing for proper decomposition. There is a hot stage to many composters, if a large volume of green material is added you may notice that the temperatures inside the composter jump up after a few days. This is a result of the all the organisms inside the composter respiring and feeding on the green and brown materials. This is a good indicator of a healthy composter.

There are all sorts of soil organisms and insects that will make their way into the composter. Don't freak out if you see tiny flies or little white insects. They apart of the composter's biome. That isn't to say there isn't the potential for harmful pests inside a composter. I personally haven't come across any to name.

### **Bedding and Grit**

There is a difference between bedding material and food for the worms. Bedding would be material like peat moss, coconut coir, soil from the backyard, and shredded cardboard or newspaper. It's best to separate your bin into a food side and bedding side. Try to just add the food to one side or portion of your composter. This way when it's harvest time for the casting you can move any recent green material to the bedding side and wait a week or two for the worms to move over, then collect and sift the castings with fewer worms to sort out. It would be beneficial to add an indicator or marking of some kind to one side of the composter.

Worms need some grit in their diet to help them break down and digest material. Sand, eggshells or coffee grounds work well.

- Eggshells can be used to add grit and calcium into the compost; however, eggshells take a very long time to break down and should be baked in an oven to cook off any *Salmonella* and break down the inner membrane of the shell then crushed to be as fine as possible before it is added the compost.
- Coffee grounds also act as a grit and a green source. Be careful with coffee grounds as too much can turn the compost to be overly acidic and affect the health of organisms inside the bin.
- Sand is a simple inert material for grit. It's cheap and plentiful. Just know that by adding larger volumes of sand will decrease the water holding capacity of the worm castings when its harvest time. On the other hand, it also improves drainage of the composter increasing tea yield.

### Timeline

It would be wise to note the date that you started the bin. It will take several months to complete the compost. Depending on the size it can take upwards of 120 days to complete. This is not a hard and fast timeline but should help guide you through and know when to harvest the castings. Larger composters like those in a 20-gallon container may take an extra month or two depending on the volume of food and number of worms present. Generally, the larger the composter the longer it can go without needing to be harvested. Harvest time should take place before the bin is completely full. Most composters should be harvested soon after it becomes over 2/3 full.

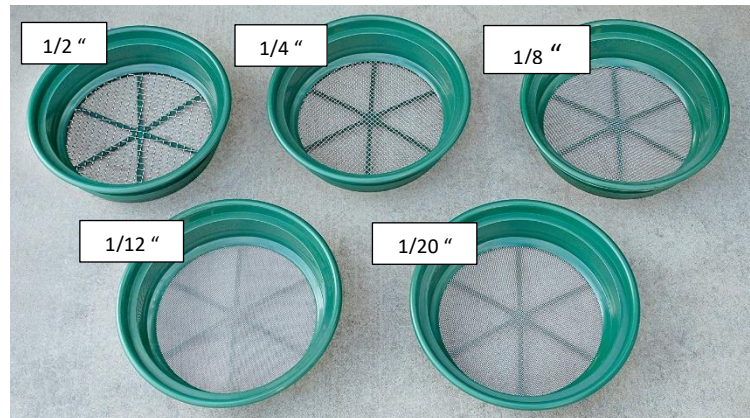
- Phase 1, Days 1-30: The compost is starting you may not see any tea collect until. You may not need to feed as often.
- Phase 2, Days 31-60: The compost is off to the races. The worms should be active and starting to reproduce.
- Phase 3, Days 61-90: The compost is nearing the end. Stop feeding as you near phase 4.
- Phase 4, Days 91-120: Check the bottom of the housing bin, if all the material has decomposed or has turned into castings then stop feeding as the compost should be almost ready to start harvesting. If you kept the bedding and feeding areas separate, then cover some food in the bedding area and give the worms a week or two to migrate to the bedding side before harvesting. You could also bury a small cup or bowl with some food to trap the worms in if you did not keep the areas separate.

## Harvest

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After roughly four months, the composter should be ready to harvest the castings. Separating the worms from the compost while collecting worm castings can be work-intensive. There are countless resources available online on how to separate these find one that works for you. I mentioned early that sections of the bin should be section into feeding and bedding sides of the composter. If that's how the composter is set up then move any decomposing material onto of the bedding side and wait a week before harvesting.

Separating the castings from the other materials in the composter requires a sifting process. Gold pan sifters should work perfectly for small scale compost and are more affordable than making your own unless you already have the materials on hand. Gold pan sifters, like the ones depicted



on the right, are also designed to fit atop a 5-gallon bucket and can be stacked on each other for faster multilayer sifting. As students at Weber State if you do not want to purchase or make a sifter you could take your compost to the community garden and sift it there. Just make sure to bring something to store your harvested castings in.

I recommended using at least two different sized sifters. 1/4 inch for medium materials and 1/8 inch to separate the castings. These two sizes will do the bulk of the work, while a 1/2 inch sifter is helpful at removing large pieces of material to be put back into the composter it is not completely necessary. The castings should have a consistency of coffee grounds. If the castings are too wet, they will stick together making it difficult to impossible to sift.

If your compost is too wet, you can remove portions from the bin and create small mounds, pyramid shaped, in a shallow open container and allow the materials to air dry. Keep this in a well-lit location and any worms present will not try to escape as they are photophobic. If any worms are in the drying compost, they will make their way down to the bottom of the mound.

While sifting you should have a small container such as a plastic cup or bowl to put any worms and cocoons you come across into. The cocoons appear as small yellow balls that look vaguely similar to



the yellow fertilizers you find in potting soil. There is no need to save every worm or cocoon you come across. There are potentially thousands of worms and cocoons in the composter. If you collect the bulk of the worms your next compost will eventually repopulate. In fact, if you are diligent enough you can divide the population of your worms during a harvest and start an additional composter.

Depending on the style of the sifter and it's the size you may need to repeat sifting several times to remove unwanted matter from the castings. As you sift there will be three types of collected material.

1. Large and unwanted material: Bits of food, rocks, large seeds, wood, and paper. These materials are not desirable in the final product. These should be removed and disposed of. Any food or worms can be saved and put back into the composter. A half-inch sifter will collect much of this material.
2. Intermediate product: This will have a mix of wet castings that have stuck together and bits of material small enough to bypass a half-inch sifter such as worms, bits of straw, and small seeds. The intermediate product will collect in both a 1/4 inch and 1/8 sifting. This material can be mechanically broken down by hand to yield more fine castings. Often you will find worms and their cocoons within intermediate product.
3. Final product: This material is primarily worm castings. It may take several sifts to reach this stage, but the less foreign organic matter the better. These castings can be stored and used for later as opposed to right away with less worry of a fungal outbreak. **After sifting the final product allow the castings to sit in a warm location for a few days and allow any small seeds to germinate then sift again to remove the unwanted materials.** 1/8 inch sifters will collect small unwanted materials and intermediate products. If you had a large amount of sand in your composter do not worry about sifting out the sand. Excess sand will only reduce water holding capacity of the casting. The more sifting you do the finer your final product will be. You may find it easier to get finer product when the castings have had a few days to air dry.

### Application

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The harvested castings can be applied in multiple ways.

- Intermediate Product: The larger bits of carbon sources and clumps of castings can be directly applied to the garden by mixing into the topsoil as a fertilizer.
- Final Product: If properly sifted to remove any, non-casting, organic matter can be stored and used later. The castings can be mixed into potting soil or applied to the surface soil of a potted plant as a fertilizer. Using a cheese cloth or similar semi-permeable material, the castings can be steeped into water to create compost-tea on demand. The steeped castings can likely be used multiple times and then directly applied to a garden's topsoil when it's ready to be discarded.

## DO's and DO-NOT'S

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### Do's

- Check on your worms every week or so and ensure the composter does not smell.
- Regularly collect the tea.
- Depending on the size of the composter harvest the castings after four months.
- Break-up green and brown material. The more broken up the green material the more water will be added to the compost and the faster it can be decomposed.
- If you have dead potted plants, you can use the soil as bedding material.
- The worms love to hide and live in root balls, if you have any dead plants with hefty root balls consider placing these throughout the composter.
- If you have an excess of green material, you can freeze it to be used later or keep the material separate and allow it to start decomposition and add it later.

### DO-NOT'S

- Add any animal products, oils, or fats to the compost.
- Add glossy or waxy paper or cardboard. If it can't be recycled it can't be composted.
- Overfill compost, slow and steady.
- Add excess water after the compost has been started.
- Add any plastic materials

### Useful items and supplies for working with compost.

- Kitchen sheers: Useful for breaking down green material for your compost.
- Nitrile gardening gloves: Gloves like these are nice when working with the compost. They are thick enough to protect your hands and keep them clean.
- Several storage containers: When harvesting your compost, it is helpful to have various storage containers to sort the different intermediate products into.
- Funnel: Useful when you are pouring out compost tea.
- Siphoning hand pump: If you are using a larger composter a siphon is a handy way to transfer tea without using a pouring method.